4.5 Negative Exponents & Reciprocals

November-13-13
10:58 AM

Two #'s with a product of 1 are reciprocals

ex. 4 and $\frac{1}{4}$ are reciprocals because $\frac{4}{1} \times \frac{1}{4} = \frac{4}{4} = 1$

ex. $\frac{2}{3}$ and $\frac{3}{2}$ because $\frac{2}{3} \times \frac{3}{2} = \frac{6}{6} = 1$

RECALL: $\boxed{a^m \cdot a^n = a^{m+n}}$ $\boxed{a^0 = 1}$

POWERS with NEGATIVE EXPONENTS

When x is any non-zero # and n is a rational #

x^{-n} is the reciprocal of x^n

$$x^{-n} = \frac{1}{x^n} \quad \text{and} \quad \frac{1}{x^{-n}} = x^n$$

Ex. #1

$5^{-2} \cdot 5^2$

$= 5^{-2+2}$

$= 5^0$

$= \boxed{1}$ ✓

and

$5^{-2} \cdot 5^2$

$= \frac{1}{25} \cdot 25$

$= \frac{25}{25} = \boxed{1}$ ✓

Ex. #2 Evaluate each power

(a.) 7^{-2} (b.) $\left(\frac{1}{10}\right)^{-3}$ (c.) $(-1.5)^{-3}$

Ex. 2 Evaluate each power

(a.) 7^{-2}

$= \frac{1}{7^2}$

$= \boxed{\frac{1}{49}}$

(b.) $\left(\frac{10}{3}\right)^{-3}$

$= \frac{1}{\left(\frac{10}{3}\right)^3}$

$= \left(\frac{3}{10}\right)^3 = \boxed{\frac{27}{1000}}$

(c.) $(-1.5)^{-3}$

$= \frac{1}{(-1.5)^3}$

$= \boxed{\frac{1}{-3.375}}$

Ex. #3 Evaluate each power $\boxed{\text{without}}$ using a calculator

(a.) $16^{-\frac{5}{4}}$

$= \frac{1}{16^{\frac{5}{4}}}$ 4th root

$= \frac{1}{(\sqrt[4]{16})^5}$

$= \frac{1}{(\sqrt[4]{2\times2\times2\times2})^5}$

$= \frac{1}{(2)^5}$ ✓

$= \boxed{\frac{1}{32}}$ ✓

(b.) $\left(\frac{25}{36}\right)^{-\frac{1}{2}}$

$= \frac{1}{\left(\frac{25}{36}\right)^{\frac{1}{2}}}$

$= \left(\frac{36}{25}\right)^{\frac{1}{2}}$ square root

$= \left(\sqrt[2]{\frac{36}{25}}\right)^1$

$= \boxed{\frac{6}{5}}$

pg. 233 #3-10, 12, 13